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## A study of the effectiveness of AN-DRGs in classification of acute admitted patients with diabetes diagnoses

Rhonda Griffiths  
*University of Wollongong*

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**A study of the effectiveness of AN-DRGs in classification  
of acute admitted patients with diabetes diagnoses**

A thesis submitted in partial fulfilment of the  
requirements for the award of the degree of

DOCTOR OF PUBLIC HEALTH  
THE UNIVERSITY OF WOLLONGONG

by

Rhonda Griffiths  
Dip.Teach(Nursing) B.Ed(Nursing) M.Sc(Hons)

**Graduate School of Health and Medical Sciences  
University of Wollongong  
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## **Abstract**

The Australian National Diagnosis Related Groups (AN-DRG) classification is intended to assign acute inpatient episodes to classes which are relatively homogeneous in terms of clinical attributes and the resources used in the provision of care. The purpose of this study was to determine the extent to which this objective was met in a sample of acute admitted patients with one or more diagnoses indicating the presence of diabetes mellitus.

The sample comprised all 2094 discharges with one or more diabetes diagnoses from acute care hospitals in the Illawarra Area Health Service in 1993-94. A subsample of 386 records was selected for the purpose of more detailed analysis by chart audit. Finally, another sample of 22 admitted patients was identified who were known to have diabetes because of their contacts with a community service, but whose diabetes had not been recorded in the discharge database.

There were three major findings. First, the discharges were distributed among many AN-DRGs in a way which was neither clinically coherent nor effective in terms of prediction of resource use. The logic of AN-DRG assignment, while effective for many types of care needs, appears to be less so where there is an underlying chronic condition. Compromises are unavoidable, but there is reason to conclude that chronic conditions have been given too little attention.

Second, there were many weaknesses in the data which are routinely assembled for the purpose of AN-DRG assignment. They included errors of medical documentation, abstraction and sequencing, and coding.

Third, the AN-DRG logic appears to ignore or under-estimate the effects of diabetes as a secondary condition. One critical finding which supports this view was that, where all diabetes diagnoses were deleted and the records re-assigned to AN-DRGs, only 10 records in 1945 (0.5%) were assigned to different classes. Diabetes diagnoses have so little effect for one dominant reason: that the DRG logic only takes account of one more diagnosis after the principal, and a condition like diabetes is characterised by multiple problems.

It is concluded that, if the AN-DRG classification is to become more effective for cases with serious chronic conditions like diabetes, modifications will be needed in the simple and near-universal logic of assignment to a diagnosis or procedure cluster followed by (selective) splitting on one more condition and/or age. Some preliminary ideas are presented as to how greater precision and clinical meaning might be achieved.

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## **Glossary of acronyms**

ACCC	Australian Casemix Clinical Committee
ALOS	Average length of stay
AN-DRG	Australian National Diagnosis Related Groups
BGL	Blood Glucose Level
CCs	Complications and Comorbidities
CCF	Complicating Clinical Factor
CMG	Case Mix Groups
DEIU	Diabetes Education and Information Unit
DRG	Diagnosis Related Group
EDCG	Endocrine and Diabetes Clinical Group
HCFA	Health Care Financing Administration
HRG	Healthcare Resource Group
HIMAA	Health Information Management Association of Australia
IAHS	Illawarra Area Health Service
IRH	Illawarra Regional Hospital
ICD-9-CM	International Classification of Diseases, 9th Edition, Clinical Modification
IDDM	Insulin Dependent Diabetes Mellitus
LOS	Length of Stay
MDC	Major Diagnostic Group
NCC	National Coding Centre
NIDDM	Non Insulin Dependent Diabetes Mellitus
PDX	Principal Diagnosis
PPS	Prospective Payment System
RIV	Reduction in Variance
SDX	Secondary Diagnosis
TRG	Technical Reference Group

## Definitions of terms

### ⊗ Average Length of Stay (ALOS)

The mean length of stay for a group of patients (National Health Data Committee 1995:2-4).

### ⊗ Length of Stay (LOS)

The period of hospitalisation for an individual patient.

### ⊗ Acute Admitted inpatient

An inpatient whose illness is acute, and has one or more problems which require short-term health care in an inpatient setting. Now termed the acute admitted patient.

### ⊗ Admission

The administrative process which begins an episode of care. Also used to refer to the start of an episode of hospitalisation.

### ⊗ Comorbidity

A secondary condition existing at the time of admission which, because of its presence with a specific principal diagnosis, causes an increase in length of stay. In the AN-DRG classification, a comorbidity is expected to result in an increased length of stay of at least one day in 75% of patients. (Eagar & Hindle 1994b:12).

### ⊗ Complication

A secondary condition arising during the hospital stay which, when present in association with one or more specific diagnosis, causes an increase in length of stay. (Eagar & Hindle 1994b:12).

### ⊗ Principal Diagnosis (PDX)

That diagnosis or condition established after study to be chiefly responsible for occasioning the patient's admission to hospital. (National Health Data Committee 1995:3-83).

## ⊗ Principal Procedure

The most significant procedure that was performed for treatment of the principal diagnosis. (National Health Data Committee, 1995:3-89).

## ⊗ Secondary Diagnosis (SDX)

Any condition additional to the principal diagnosis which affects patient care by requiring clinical evaluation, therapeutic treatment, diagnostic procedures, extended length of stay, or increased nursing care or monitoring. Includes complications and comorbidities. (Eagar & Hindle, 1994b:39).

## ⊗ Cost weight

A measure of the average cost of an AN-DRG, compared with the average cost of a reference AN-DRG. Usually the average cost across all AN-DRGs is chosen as the reference value, and given a weight of 1. (Eagar & Hindle 1994b:6).

## ⊗ Insulin Dependent Diabetes Mellitus (IDDM)

A type of diabetes that most commonly occurs in people aged less than 35 years and is characterised by an absolute failure of the pancreas to produce insulin. The disorder is characterised by sudden onset of symptoms which include frequent urination, thirst, hunger and blurred vision. Untreated the condition can progress to ketoacidosis and death. People with IDDM depend upon insulin injections to sustain life (Dunning 1994).

## ⊗ Iso-Resource Group

All cases within the group cost approximately the same to treat.

## ⊗ Non Insulin Dependent Diabetes Mellitus (NIDDM)

A type of diabetes that most commonly occurs in people over the age of 35 years. NIDDM differs from IDDM in that the slow onset means that people can have NIDDM for several years before the condition is diagnosed.

People with NIDDM often produce adequate quantities of insulin, however because the body becomes resistant to the insulin that is produced, it is not effective. Treatment requires diet and exercise which may be supplemented by oral hypoglycaemic therapy (tablets) and/or insulin. An estimated 40% of people with NIDDM use insulin to improve control and are termed insulin requiring (Dunning 1994).



## ⊗ Outlier

A discharge that is outside of the normal distribution which describes the majority of cases within an AN-DRG. Removal of outliers from aggregate data results in more reliable comparisons of the frequency distribution of the remaining data (Reid 1991:7).

## ⊗ Australian Casemix Clinical Committee (ACCC)

A body formed in 1991 to provide clinical input to casemix issues, and particularly development of the AN-DRG classification.

## ⊗ International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)

A modification of the international standard classification of diagnoses and procedures (ICD-9), which is maintained by the US government. It has been clinically modified for morbidity coding, and especially for use in acute care.

## ⊗ Major Diagnostic Categories (MDCs)

A high level of grouping of patients according to principal diagnoses, use in the Diagnosis Related Groups (DRG) casemix classification. The Australian National DRG variant has 23 Major Diagnostic Categories.

## ⊗ Trimming

The process of removal of unusual cases prior to production of statistics. For example, analysis of trimmed DRG data would involve prior removal of (say) patients who were in hospital for unusually short or long periods.

## ⊗ Trim point

The value of a variable above or below which patient care episodes may be trimmed.

## ⊗ Variance explained, reduction in variance (RIV)

In the classification design context, the proportion of total variance which is between (rather than within) classes. A measure of the effectiveness of the classification. Also known by the statistic  $R^2$  (the coefficient of multiple determination).